United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

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APR 15 2003

APR 30 2003

Memorandum

To: Project Leader, Arapaho National Wildlife Refuge

From: Chief, Division of Water Resources

Subject: 2002-2003 Annual Water Use Report/Management Plan

The subject reports for Arapaho National Wildlife Refuge Complex (Bamforth Lake, Hutton Lake, and Mortenson Lake National Wildlife Refuge Satellites) have been reviewed and approved.

Attached is the Review/Approval page for your files. Thank you for the timely submission of this report.

Attachment

ARAPAHO NATIONAL WILDLIFE REFUGE COMPLEX
HUTTON LAKE NWR, BAMFORTH LAKE NWR,
MORTENSON LAKE NWR SATELLITES

ANNUAL WATER MANAGEMENT PLAN
2002 WATER USE REPORTS
2003 RECOMMENDATIONS

Prepared: Pam Bilbrey — Wildlife Biologist — Date: 3/30/03

Submitted: Gregory J. Sauger — Project Leader — Date: 3/31/03

Approved: R. W. Cole — Refuge Supervisor, CO, KS, NE. — Date: 4-3-03

Reviewed: Chuck Willis — Chief, Div. of Water Resources — Date: 4-14-03

ANNUAL WATER MANAGEMENT PLAN 2002-2003

Arapaho National Wildlife Refuge

I. Introduction

Arapaho National Wildlife Refuge uses five primary sources of water to provide irrigation, maintain pond levels and sustain riparian vegetation for wildlife. These five sources are the Illinois River, Spring Creek, Antelope Creek, Soap Creek and Potter Creek. Sixteen different headgate structures divert water out of the Illinois River into more than 70 miles of primary delivery ditches. This water supplies over 77 ponds with over 814 surface acres of water and irrigates over 9,000 meadow and riparian acres during a normal year.

The Refuge is in the third year of a drought and water conditions in 2002 were the worst ever documented on the Refuge. In 2002, the Illinois River opened in early March with average flows throughout the spring with very little flooding and no real peak. The Hubbard #2 and Howard headgates were opened in early April with ditches ice free and flowing. Due to a storage call initiated the third week of March, by Walden Reservoir, these were the only two ditches that could be opened as they had senior storage rights. The storage call was replaced by an irrigation call in late April. The Refuge decided not to run available irrigation water in May due to the fact that the Illinois River flows were so low. Some irrigation in June was attempted but senior rights and low flows in the River shut this effort down quickly.

Wetland conditions for the spring were extremely poor with most ponds dry from the fall of 2001. Only Case Reservoirs #2 & #3, East and West Fish Hatchery, Elk, Horseshoe, Bluebill, Spring Creek and Headwater Ponds received water during the early spring. Water conditions deteriorated rapidly in June with all but one headgate closed during the summer due to the irrigation calls on the Illinois. Home ditch, which has a senior irrigation right shared by the Refuge and a private landowner, ran through June in an effort to fulfill the private landowners irrigation call. The River was dry on the north end by July and the whole River on the Refuge was reduced to intermittent pools by August. Flows never returned in the fall before freeze up.

Precipitation in 2002 was 10.25 inches with snowfall measuring 42.5 inches in Walden. Extreme temperatures were 94° Fahrenheit in July and -28° Fahrenheit in March. Snow pack levels in the Illinois River drainage were in the 60 percentile of normal throughout the winter of 2001/2002. Winter snow packs for 2003 are somewhat better with the Illinois River drainage up near 100 percent of normal by March of 2003. The outlook for Refuge wetlands this spring are poor with most wetlands dry and the big storage reservoirs in the County very low. By March, storage calls are already on and the Refuge only has senior rights for the three Case Reservoirs and MacFarlane Reservoir.

II. Purpose and Methods

Spring run-off is diverted from natural water courses into delivery ditches to provide wetlands and irrigation systems with water. Approximately 9,000 acres of meadow and riparian are flood irrigated to maintain and perpetuate quality nesting habitat for waterfowl, shorebirds
and other wetland dependent birds. Numerous ponds are also managed via diverted water each year to provide breeding and brood rearing habitat for these same birds.

Current water management practices greatly depend on winter snow packs, spring moisture and downstream water demands. Future water management practices will address the Refuge's depletion issues and work toward keeping depletions at the current average level. A petition for junior storage rights for all ponds without existing storage rights was submitted the first of 2003. These rights will be administered by the local State Water Commissioner. At this time the following management practices will be used:

March/April - (spring breakup) Open river headgates as snow pack allows, with major headgates opened early to mid April. This water will flow directly into ponds to create as much open water as possible to attract and hold migrating waterfowl. Refill the Case Reservoirs, which were drained in the fall, with spring run-off water plus river flows and hold at optimum levels to provide breeding and brood rearing areas for water birds. All of the above will depend on senior storage calls on the River.

May - Initiate meadow irrigation as soon as ditches are ice-free and operable to provide optimum habitat for nesting waterfowl, shorebirds and other marsh birds. Perform ditch maintenance as needed. Record water flow measurements weekly. If needed make water conservation efforts on a select group of headgates using information provided in Table I and seniority of the irrigation right on the ditch.

June - Maintain pond levels and continue irrigation to maintain habitat for nesting, and breeding birds. Record water flow measurements weekly. If needed make water conservation efforts on a select group of headgates using information provided in Table I and seniority of the irrigation right on the ditch.

July - Consolidate water as necessary to provide brood habitat for waterfowl, shorebirds and other wetland dependent birds. Record water flow measurements weekly. River flows may increase during this month, as off Refuge irrigation ditches are shut-down for haying. Continue irrigation in the early part of the month, as water permits, for waterfowl nesting habitat.

August - Begin repairs on dikes and control structures and any new construction projects. Most ditches will be closed by this time, water flow measurements will

continue on all open ditches. Maintain minimal water flows in specific ditches to provide stock water as part of the Refuge Grassland Management Plan.

September -. Drain upstream storage reservoirs (Case #1, #2, #3) on to lower units to recharge smaller ponds before freeze up if water was not under a storage call when the reservoirs were filled. Continue work on construction and repair projects. Record water flow measurements weekly on any ditches still open.

October - Prepare for scheduled recharge fill of storage reservoirs as needed. Winterize water system, drain irrigation ditches, "set" water system in preparation for spring run-off. Continue construction and repair work as needed. Initiate drawdown of ponds on schedule.

November - Normal freeze-up period. Pre-snowfall 'dirt work' still possible.

December - March - Normally cold, frozen conditions prevent water management. Nesting structures can be repaired/maintained and water management structures can be built.

III. 2002 Water Usage

Water usage is determined primarily by weekly recordings of water flows through Parshall flumes located just downstream from the various headgates or diversion structures in each irrigation ditch system. In the spring of 1997, Water Resource personnel from the RO and State Water Commission checked most of the Refuge flumes and determined that many were not reading accurately. They recommended a 'chip test' be used in order to achieve accurate measurements. The chip test has been used since that time on all flumes documented to be inaccurate. In instances where measuring devices have not been installed, estimates are made relative to the known water use in other irrigation systems during the year. The Refuge does have a flow meter but with poor flows in 2002 the meter was not put to use. Efforts to use the meter this year to get more readings on flumes not reading accurately will be initiated if flows are available.

A total of 1,931 acre feet of water was diverted in 2002, approximately 7,770 acre feet less than 2001 and 12,370 acre feet less than 2000. This dramatic decrease was due to the severe drought the area is in. Water flows were all determined by storage and irrigation calls on the Illinois and were administered by the local water commissioner.

Several misconceptions need clarification concerning the Refuge ditches and total acre feet of water used. The total acre feet is determined by adding most ditch flume readings to estimates of acre feet of several spring fed ditches (Table II). It should be noted:

The Hubbard #2 ditch originates off the Illinois River. The Hubbard #3 (Rat Ditch), Hubbard #4 and the Hubbard Caudle Extension all originate off the Hubbard #2, therefore they are not added into the total acre feet diverted.

The Refuge shares water rights on the Midland, Everhard Baldwin and the Howard ditches and total acre feet for each of these ditches is as follows:

Midland Hackley - Acre feet diversion at flume is all Refuge water

Midland Ross - Midland flume reading minus the Hackley flume reading divided in half. The Refuge diverts approximately 50% or 5 cfs of the water, the rest of the water is Anderson's, as Burr's use their 5 cfs before the Midland flume.

Howard - half of the flume acre feet reading, the Refuge has 50% of the water right.

Everhard Baldwin - The Refuge owns 47% of the total acre feet, thus the flume acre feet reading is multiplied by .47.

The Oklahoma #1 flume reading is influenced by large volumes of non-Refuge secondary water during the irrigation season. So in many cases the total acre feet reading for this ditch is much higher than what is actually diverted by the Refuge. If possible, total acre feet should be an estimated amount of the flume reading and/or the headgate should be closed during the irrigation season.

IV. Proposed 2003 Water Use

Water use in 2003 will be influenced by the fact that the majority of Refuge ponds are treated as though they have junior storage rights, which in a dry year means they may not be filled at all. In 2002 over 20 miles of major ditches on the Refuge were cleaned and it is hoped this will improve the efficiency of our water system. Staff also now have a better understanding of the ditch system and have been trying to be more pro-active with irrigation efforts. Irrigation calls on the Illinois River will still dictate what irrigation is done on the Refuge. Optimum water levels will be maintained for as long as possible to encourage waterfowl and other wetland dependent birds breeding, nesting and brood rearing.

One of the following general plans, most likely the extremely dry water year plan, will be implemented in 2003:

Plan A - Average Water Year

1. Refuge ponds will be filled as early as possible to attract spring migrants to remain and nest. Two to three ponds will be held at 80 percent capacity to provide shoreline habitat for migrating shorebirds during May and early June.

2. Meadow areas will be irrigated by take-outs in the diversion ditches or sub-irrigated by seepage from the ditches.

3. As many ponds as possible will be maintained at optimum levels for as long as possible. If necessary some ponds may be sacrificed for more important brood ponds later in the summer.

4. Following the upstream irrigation season of hay meadows, increased flow in the Illinois River may be used to refill some ponds in order to provide fall migrational habitat and reserve water for the following year.

Plan B - Extremely Wet Water Year

1. Ponds will be filled as soon as possible to attract spring migrants to remain and nest.

2. Marginal meadow areas not normally irrigated will be irrigated to provide additional wetland habitat for wildlife.

3. Additional water will be circulated through impoundments keeping them fresh, which will aid in the production of emergent and submergent vegetation and encourage invertebrates as sources of food and cover for wildlife.

4. Four to six ponds will be held at 80 percent capacity to provide shoreline habitat for migrating shorebirds during May and early June.

5. Water will run longer in the season keeping ponds relatively full at freeze-up. This will help ensure that at least some water will be available the following spring even in the event of a dry year.

6. By running the water longer, many small wetland depressions in the meadows can be maintained as brood rearing habitat, thus preventing concentrations of broods on a few ponds where they are more susceptible to predation and disease outbreaks.

Plan C - Extremely Dry Water Year

1. Fill as many ponds as possible to capacity and maintain to provide water for breeding and nesting pairs and cover for broods and molters.

2. Irrigate Refuge meadows adjacent to permanent bodies of water.

3. Irrigate Refuge meadows further removed from permanent ponds as available water permits.

4. Review implementation of drawdowns to conserve as much water in the most important ponds for as long as possible.

V. Planned Drawdown

A drawdown plan was established in 1999 but will not be used this year as most most ponds are already dry. When water levels return to near normal this plan will be reviewed and started up again (Table III).

Water management is sometimes dictated by priorities set for rehabilitation of dikes and control structures. Rehabilitation will still play a role in selecting which ponds to draw down.

VI. Comments and Problems

The following water management related projects were accomplished in 2002.

1. Home ditch was rehabed north of Home Pond with a ditch check repaired. A blow out in Home ditch in Home Pond was patched.

2. The lower Everhard Baldwin feeder ditch was rehabilitated in fields C and D.

3. Approximately 20 miles of ditch was cleaned on the Refuge, the ditches included: Hubbard #2 west of the highway and from the River to the Caudal split; all of the Caudal, Boyce Brothers and Hill & Crouter; the Oklahoma #1 from north of the Allard inroad to the split near the Anderson Drain; the Midland ditch from the Refuge boundary south to the flume then along the road to MacFarlane. This rehabilitation of the ditches also included replacement/rehab of ditch structures when possible.

4. The feeder ditches of the Lateral C ditch in fields S8 and S9 were worked on to improve irrigation.

5. Boyce Brothers headgate and river check were rehabilitated including reshaping the river bed.

6. MacFarlane Reservoir dike was sprayed with herbicides to remove shrub type plants in response to a dam safety inspection.

7. The turn wheel for the MacFarlane Reservoir water control structure was replaced.

8. Case Reservoir #1 was rehabilitated by a private contractor, the dike was reshaped, rip-rapped and a new water control structure was installed

9. Construction began on Lanier pond in the Soap Creek drainage.

10. Several feeder ditches along the Oklahoma #1 north of the Allard inroad were cleaned.

The following work, not in priority order, is needed and will be accomplished as manpower and working conditions permit:

1. Install new water control structures in several ponds, need will be determined by age of old structure.

2. Install and\or rehab Parshall flumes as needed, including Midland Extension, Midland Anderson, Midland Ross, Hubbard #4, and Hill & Crouter.

3. Replace deteriorating or missing river headgates on the, Hill & Crouter, Dryer, Ward #2, and Ish Baldwin ditches.

4. Continue ditch cleaning as time and money permit.

5. Measure capacity of Fish Hatchery spring (Potter Creek) to determine amount of water flowing into Potter #2 ditch.

6. Construction of Langer, Lanier and Stefanic ponds on Soap Creek.

7. Continue to rehab ditch take-outs and ditch checks in ditches that were cleaned.

8. Spray Muskrat dam with herbicides to remove shrub type plants for dam safety.

Table I - Dry Year Contingency

Headgate Name	Restrictions	Schedule
Boyce Brothers	Refuge has full water right.	Adjust flow rates and timing.
Dryer	Refuge has full water right.	Shorten time frame with lower flow rates or dry up.
Everhard Baldwin	Shared water right.	Refuge does not have control of headgate.
Hill & Crouter	Refuge has full water right	Shorten time frame that ditch runs.
Home #1	Shared water right	Refuge must provide water to private landowner downstream.
Howard	Shared water right	Refuge does not have control of headgate.
Hubbard #1	Refuge has full water right	Adjust flow rates and timing.
Hubbard #2	Refuge has full water right	Adjust flow rates and timing.
Ish Baldwin	Shared water right	Does not have a functioning headgate
Midland	Shared water right	Refuge does not have control of headgate.
North Park #6	Refuge has full water right	Shorten time frame with lower flow rates or dry up.
Oklahoma #1	Refuge has full water right	Open in April, close during irrigation season, re-open after irrigation if needed.
Oklahoma #2	Refuge has full water right	Adjust timing of opening and closing.
Ward #1	Refuge has full water right	Adjust flow rates and timing.
Ward #2	Refuge has full water right	Headgate not operable. Fix or close down?
Ward #3	Refuge has full water right	Shorten time frame with lower flow rates or dry up.

Table II - Total Refuge Diversions

DITCH	REFUGE 2002 ACRE FEET DIVERTED	REFUGE 2001 ACRE FEET DIVERTED	REFUGE 2000 ACRE FEET DIVERTED
Antelope**	50	150	175
Boyce Brothers	0	306	745
Dryer	0	94	0
Everhard Baldwin	413	1229	1310
Hill & Crouter	0	0	0
Home #1***	217	444	970
Howard	679	1443	1278
Hubbard #1	0	0	117
Hubbard #2	342	2824	3720
Hubbard #3 (Rat)*	0	85	339
Hubbard #4*	342	1946	2840
Hubbard Caudle*	0	793	541
Ish Baldwin**	25	50	75
Midland (Ross)	32	756	1260
Midland (Hackley)	0	139	120
Midland (Curtis)	0	460	1026
North Park #6	0	60	55
Oklahoma #1	0	284	908
Oklahoma #2	0	180	297
Potter #2**	25	100	125
Riddle Ditch	0	31	546
State Walden**	300	500	450
State Walden Res.**	35	35	35
Ward #1	30	688	940
Ward #2**	0	100	150
Ward #3	0	0	0
TOTAL	1931	9[illegible]	14302

* Recorded under Hubbard #2.

** These figures are estimates.

*** Home ditch was not used by Refuge, this water was called by a private landowner who owns half of Homes 4 cfs.

Table III - Pond Drawdown Schedule

POND	DATE	PRESCRIPTION	STATUS
Eagle Pond	Late October 1999	Release water into Rat Ditch. Keep pond dry through summer, refill spring of 2001.	Refill of pond delayed due to dry conditions. Will refill in spring of 2003 if water available.
Elk Pond	October 1999	Release water to '76 and Reservoir #2. Keep pond dry through summer, refill spring of 2001.	Completed, but pond was not refilled. Will refill in spring of 2003 if water available.
Reservoir #1	Tentatively June 2001 or right before construction begins.	Release water to Goose Pond. Keep pond dry through summer and fall, refill spring of 2002.	Water released in fall of 2001, construction completed spring 2002. Refill spring 2003.
S. School Section Pond	May 2001	Release water to N. School Section. Keep pond dry through summer refill spring of 2002.	Delayed due to dry conditions.
Brocker Pond	October 2000	Release water to meadow. Keep pond dry through summer, refill spring of 2002.	Delayed due to dry conditions.
Prairie Dog Pond	Late October 2001	Release water to Antelope Pond. Keep pond dry through summer, refill fall of 2002.	Delayed due to dry conditions.
Rizor Pond	Late October 2001	Release water to Follett Pond. Keep pond dry through summer, refill fall of 2002.	Delayed due to dry conditions.

Schedule is subject to change if dike work is needed on a specific pond.

ANNUAL WATER MANAGEMENT PLAN 2002-2003

Mortenson Lake National Wildlife Refuge
Administered by Arapaho National Wildlife Refuge

I. Water Rights

Priority	Ditch	Date Use	Acre Feet	Acres	Source
Permit #5617	Soda Lake Reservoir	1947 Storage Irrigation	153 AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20459	Soda Ditch	1947 Supplemental	--	188	Pioneer Ditch Natural Springs Runoff
Permit #5631	Harman Reservoir	1947 Storage	87 AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20133 #20132	Harman Ditch	1947 Irrigation 1947 Irrigation	— 1.10cfs	—	Pioneer Ditch Natural Springs Runoff
Permit #4454	Johnson #1 Stock Res.	1962 Storage	1.37 AF	--	Pioneer Ditch Runoff
Permit #4455	Johnson #2 Stock Res.	1962 Storage	1.72 AF	--	Pioneer Ditch Runoff
Permit #7259	Mortenson Lake	1967 Storage	247 AF	--	Pioneer Ditch Natural Springs Runoff

II. 2002 Water Usage

There was no supplemental runoff water in the South Canal from adjacent landowner Swanson this year. The results of this dry year were apparent with Gibbs, Soda and Garber Lakes water levels dropping. Gibbs water level declined the most with less than 30% of the wetland left in the Fall. With the drop in water levels, saline levels are increasing in these lakes. Snowpacks are average in Wyoming but with the last two years being extremely dry the outlook for spring runoff is sparse.

III. Capacity of Refuge Lakes

LAKE	MAXIMUM SURFACE ACRES	MAXIMUM ACRE FEET	ACTUAL SURFACE ACRES (EST.) 4/02	ACTUAL SURFACE ACRES (EST.) 12/02
Mortenson	65	247	60	45
Garber	--	--	--	--
Soda	46	152	40	28
Gibbs	--	--	--	--
Harman	--	--	--	--
TOTAL	111	399	100	73

IV. 2003 Proposed Water Use and Management Needs

Any excess water in the South Canal will be diverted for irrigation purposes as in previous years.

If time and funds permit the following work will be done: replace old nonfunctional water control structure between Meebor and Soda Lakes, rehab the ditch dike along Soda Lake, and survey Garber, Gibbs and Harman with GPS units to calculate surface acre capacity.

Continue to investigate conversion of water rights to include 'fish and wildlife' as a purpose in all impoundments.

Continue to investigate the need to file for additional water rights in Soda, Gibbs, Garber and Harmon Lakes.

ANNUAL WATER MANAGEMENT PLAN 2002-2003

Hutton Lake National Wildlife Refuge
Administered by Arapaho National Wildlife Refuge

I. Water Rights

Priority	Ditch	Date Use	CFS	Acres	Source
1	Red	1872 Irrigation	.15	10	Sand Creek
9	Richards	1888 Irrigation	.60	42	Sand Creek
12 ½	Hutton Lake Reservoir	1892 Irrigation	2,500 AF	--	Sand Creek
Permit #5212-E	1st Enlargement Hutton Lake Ditch	1939 Irrigation Bird Refuge	1.6	112	Sand Creek
Permit #2304-E	Enlargement Kings Ditch	1909 Irrigation	Portion of 8.27	Portion of 579	Laramie River

II. 2002 Water Usage

For a second year in a row Sand Creek was not opened, thus no water was diverted onto the Refuge. Creighton, and Rush Lakes were dry the fall of 2001 and remained dry through 2002. Hoge and George Lakes declined over the summer and were dry by August. The North Forty area gained some water in the spring but was also dry by August. Hutton Lake still had water by freeze up but was only about 20 percent full.

ANNUAL WATER MANAGEMENT PLAN 2002-2003

Hutton Lake National Wildlife Refuge
Administered by Arapaho National Wildlife Refuge

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III. Capacity of Refuge Lakes

Lakes	Maximum Surface Acres	Maximum Acre Feet	Actual Surface Acres (Est.) 4/02	Actual Surface Acres (Est.) 12/02
Hutton	221(Variable)	1135	88	45
Hoge	75	200	30	0
Rush	95	250	0	0
George	16	62	6	0
Creighton	210	2525	0	0
Total	617	4172	118	45

IV. 2003 Proposed Water Use and Management Needs

Outlook for any water to divert this year is poor even though snowpacks are average as of March. The drought of the last two years has drained reservoirs and the soil is very dry, calls on the Laramie River will limit available water to divert. If water does come available it will be used to fill Rush Lake to a level that will allow the diversion of water out of Rush Lake to Lake George to re-establish Wyoming Toad habitat and then to the other lakes if water is available.

If time and funds permit the following work will be done: Re-set the Parshall flume and widen the Sand Creek ditch between the headgate and flume. Rebuild islands in Rush pond.

Control of salt cedar along the edges and islands of all lakes. This may include spraying if water conditions permit.

2003 WATER MANAGEMENT PLAN
2002 USE REPORT
SHORT FORM

Station Name:
Bamforth NWR, WY

Date of Inspection:
June 21, 1989

Water Right No:
1887-Territorial

Source(s):
Little Laramie River

Water Diverted:
Yes

Means of Diversion:
Rate

Impoundments:
Yes

Water Level: 2 AF
(Elev. or Est. Storage)

Wells:
Free Flowing - N/A
Pumped - N/A

Type of Use:
Surface Irrigation Crop
Fish & Wildlife
Stock

Overall Climatic Conditions:

Water conditions were poor in 2002, the Park Ditch had no flows during the year so no water was diverted onto the Refuge.

Conditions of Facilities:

The Park Ditch is in fair to poor condition and in need of some rehabilitation. The cost/benefit ratio of such rehab is questionable due to poor irrigation water rights and availability.

Proposed Water Program:

2003 - Continue to irrigate meadows when adequate water is available in the Park Ditch. Mark Johnson, Refuge neighbor and grazing permittee on the refuge, conducts all irrigation activities as a condition of his grazing permit.

Comments:

The Park Ditch contains 18.42 cfs of high water right that is not honored except in excellent run-off years because of the large amount of water appropriations senior to its 1887 and 1900 applications. The principal Little Laramie River water user is the Wheatland Irrigation District. The Park ditch receives water only before the District "calls" for its water and only in proper adjudicated order. The Park Ditch headgate is the first one to be closed by the Water Commissioner when the Wheatland Irrigation District calls for water. Our water right for 1.71 cfs in the Park Ditch is therefore a poor water right.